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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,199	03/10/2004	Charles Emory Hughes II	43689-016100	2437

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EXAMINER	
GRAHAM, ANDREW R	
ART UNIT	**PAPER NUMBER**
2644	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/796,199	HUGHES ET AL.	
	Examiner	Art Unit	
	Andrew Graham	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-19 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 10 March 2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 7/12/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 7/12/04 was filed after the mailing date of the application, but before the first action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 3, 5-6, and 17-18** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 states "the low pass filter has a different frequency for each pair of drivers". Claim 2, from which Claim 3 depends, states "n>0" and Claim 1, from which Claim 2 depends, states "n=0 at the innermost pair and n increases by 1 for each at least a subsequent pair of drivers". This "at least *a* subsequent pair" requires only one pair of subsequent drivers to be included in the system, such that a n=1 meets the requirements of Claims 1 and 2. However, by stating that a "different frequency" exists for the low pass filter of "each"

pair of drivers suggest that at least two drivers with low pass filters exist in the system (n>1), which is not required by the scope of Claims 1 and 3 as noted above. Accordingly, Claim 3 fails to distinctly claim the subject matter regarded as the applicant's invention. Appropriate correction or clarification is required. A suggested amendment to overcome this rejection for Claim 3 would be "The loudspeaker of Claim 2, wherein n > 1 and the low pass filter has a different frequency for each pair of drivers".

Claims 5 and 6 are rejected due to their dependency upon Claim 3.

Claims 5 and 17 also recites the limitation "the frequency" in the first line of each respective claim. There is insufficient antecedent basis for this limitation in the claim. It is further noted that a "frequency" to which this limitation is intended to refer, as filters are associated with a variety of frequencies, including but not limited to corner or resonance frequencies.

Claim 18 is rejected due to their dependency upon Claim 3.

Claim 6 also states that "the low pass filter on the outermost pair of drivers in the array has a lower frequency than calculated by $f_n = 2c/d_n$ for the outermost pair of drivers". Claim 6 depends on Claim 5 and thus incorporates all of the limitations of Claim 5. Claim 5 states that "the frequency, f_n, of the low pass filter is equal to $2c/d_n$, where c is the speed of sound". The limitation of Claim 6 for the outermost pair conflicts with the limitation of Claim 5 for the outermost pair. For example, if n=3, f_3 is the frequency of the outermost low pass filter. According to Claim 5, $f_3 = 2c/d_3$.

According to Claim 6, however, $f_3 < 2c/d_3$. Thus, the frequency of the outermost pair cannot meet both of the limitation of Claims 5 and 6 (as required by the dependency of Claim 6 on Claim 5) because Claim 6 states that the frequency is less than the calculated frequency, but Claim 5 states that the frequency is equal to the calculated frequency.

Claim 18 also recites the property cited above in Claim 6 for a filter of the outermost speaker pair and is rejected for the same reasons as applied above in that such a relationship conflicts with the requirements of its respective parent claim, Claim 17. Appropriate correction or clarification is required.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "driver centered" of Claim 7 and its equivalents in Claim 11 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from

the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1-2, 14-15, and 17-19** are rejected under 35 U.S.C. 102(b) as being anticipated by Oyaba et al (USPN 4991687)(hereafter, "Obaya").

Obaya teaches a directional speaker system that comprises a line of paired speakers with particular operating frequencies and respective spacings.

Specifically regarding **Claim 1**, Obaya teaches:

A loudspeaker system (Figure 1) having a line array of drivers (L_l, H_l, H_r, L_r) comprising:

a first pair of drivers (H_l, H_r)(col. 2, lines 56-59);

a center point (crossing of "central axis" and direction of relative 90°) along the line array (col. 5, lines 5-9),

wherein the pair of drivers are substantially centered about the center point (implicit, "center" axis as noted above, Figure 1) with a center to center distance of d_0 (d_2 in Obaya) between the first pair of drivers (H_l, H_r)(col. 2, lines 56-59; col. 5, lines 35-42); and

at least a subsequent pair of drivers (L_l, L_r) arranged in the line array with the first pair of drivers (straight line, col. 1, lines 10-14, Figure 1) and substantially centered about the center point (crossing of "central axis" and 90° direction, Figure 1; col. 2, lines 45-55),

wherein the subsequent pair of drivers (L_l, L_r) are spaced such that the center to center distance between each at least a subsequent pair of drivers, dn (d_1 in Oyaba),

is equal to $4nd_o$ ($4*n*d_1$ in Oyaba), where n = 0 at the innermost pair of drivers and n increases by 1 for each at least a subsequent pair of drivers (col. 2, lines 56-59, $d_2 = d_1/4$ equates to $4*1*d_2=d_1$, wherein Figure 1 meets the case of n=1 in the claimed formula "$4nd_o$").

Regarding **Claim 2**, Oyaba discloses:

The loudspeaker system of claim 1, further comprising a low pass filter on every pair of drivers for n > 0 (L_l,L_r are supplied signals through a low pass filter, col. 2, lines 45-53).

Regarding **Claim 14**, Obaya discloses:

A method for optimizing a radiation pattern (more than 20 dB attenuation in direction of 90° relative to central axis) of drivers (H_l,H_r,L_l,L_r) in a line on a loudspeaker (Figures 1 and 2, col. 4, lines 12-29),

the method comprising the steps of:

selecting a spacing, d_0 (d_2 in Obaya), between the centers of a pair of innermost drivers (H_l,H_r) according to the formula

$d_0 = c/2f$

wherein c is the speed of sound and f is the maximum desired operational frequency (f_2 is upper frequency of two octaves over which narrow directivity is obtained, col. 4, lines 45-48; d_2 is spacing between high frequency range speakers, col. 2, lines 56-59; high frequency speakers output f_2, col. 2, lines 59-63; λ_c is wavelength corresponding to f_c, or $f_c*\lambda_c=c$, where c is speed of sound, inherent relationship between wavelength and frequency, in view of col. 2, line 55; $f_2=2f_c$ and $d_2=d_1/4= \lambda_c/4$, col. 3, lines 61-62; solving $f_c*\lambda_c=c$ for f_2 and d_2, $(f_2/2)*(4*d_2)=c$, which equates to $d_2=c/2f_2$);

selecting a center point in the line (intersection of central axis, line to P_0, with line to P_{90}), wherein the center point is the same position on the line as $d_0/2$ (by definition, center or central axis, col. 4, lines 12-15); and

determining the spacing of at least one additional pairs of drivers (L_l,L_r) in the line (Figure 1)(col. 2, lines 45-48)

wherein each driver of the additional pair of drivers is added to the outermost positions of the line (Figure 1),

wherein the distance, d_n (d_1 in Obaya), between the centers of the additional drivers is according to the formula

$d_n = 4nd_0$ ($d_2 = d_1/4$ or $d1=4d_2$, wherein n=1, col. 3, lines 61-62)

where n = 0 at the innermost pair of drivers and n increases by 1 with each pair of drivers sequentially added along the array (case in Figure 1 represents situation where n=1).

Regarding **Claim 15**, Obaya discloses:

the pairs of drivers (at least Ll,Lr) are used in conjunction with low pass filtering (col. 2, lines 47-53).

Regarding **Claim 17**, Oyaba discloses:

the frequency, f_n ($2f_c$ in Oyaba)(-18dB or .125 gain frequency in Oyaba), of the low pass filter is equal to $2c/d_n$, ($\lambda_c = d_c$) where c is the speed of sound (col. 2, lines 48-55).

Regarding **Claim 18**, Oyaba discloses:

the low pass filter on the outermost pair of drivers in the array has a lower frequency than calculated by $f_n = 2c/d_n$ for the outermost pair of drivers (in view of $f_n = 2f_c$ as applied above in Claim 5, Oyaba teaches that the d_1 spacing of outer drivers may be λ_c +50%, which may have exhibited a better directivity characteristic; applying such a teaching to outer, added pairs of driver equates to "lower frequency than calculated")

Regarding **Claim 19**, Obaya discloses:

the maximum desired operational frequency is substantially the highest frequency without high amplitude side lobes (f_2 is upper frequency of range over which narrow directivity is obtained, which comprises not affecting peak values in directivity pattern, Figure 2, as compared to Figure 4, col. 1, lines 35-38, col. 4, lines 39-48; also, f_2 and d_2 meet formula of Claim 14, thus properties associated with such a formula are met by f_2 and d_2; specification page 7, lines 3-8 state that such spacing establishes uppermost frequency to which the array will reduce high amplitude side lobes)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 3, 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oyaba as applied above, in further view of Flanagan (USPN 4653606).

As detailed above, Obaya teaches a directional speaker system that comprises a line of paired speakers with particular operating frequencies and respective spacings.

Regarding **Claim 3**, Obaya discloses that the outer pair of speakers L_l, L_r) is low pass filtered, and that additional outer transducers may be added to increase the operational frequency range (col. 4, lines 45-56), but does not specify:

the low pass filter has a different frequency for each pair of drivers.

Flanagan teaches a transducer system with a directional response.

Specifically regarding Claim 3, Flanagan teaches:

the low pass filter has a different frequency for each pair of drivers (col. 4, lines 56-68; col. 5, lines 1-23; col. , lines 14-16 and 61-63)

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement an low pass filters on the additional drivers of Oyaba with a cutoff frequency lower than that of the inner or middle drivers as is taught by Flanagan. The motivation behind such a modification would have been that decreasing the size of the array as the frequency of the transduced sound increases would have minimized beamwidth variations over the desired frequency range.

Regarding **Claim 5**, Oyaba discloses:

the frequency, f_n ($2f_c$ in Oyaba)(-18dB or .125 gain frequency in Oyaba), of the low pass filter is equal to $2c/d_n$, ($\lambda_c = d_c$) where c is the speed of sound (col. 2, lines 48-55).

Regarding **Claim 6**, Oyaba discloses:

the low pass filter on the outermost pair of drivers in the array has a lower frequency than calculated by $f_n = 2c/d_n$ for the outermost pair of drivers (in view of $f_n = 2f_c$ as applied above in Claim 5, Oyaba teaches that the d_1 spacing of outer drivers may be λ_c +50%, which may have exhibited a better directivity characteristic; applying such a teaching to outer, added pairs of driver equates to "lower frequency than calculated")

Regarding **Claim 7**, Flanagan discloses:

a driver (322) centered on the center point of the line array (col. 4, lines 62-65, Figure 2).

6. Claims 4, 8, 9, 11, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obaya as applied above, and in further view of Steuben (USPN 5359664).

As detailed above, Obaya teaches a directional speaker system that comprises a line of paired speakers with particular operating frequencies and respective spacings.

Regarding **Claim 4**, Obaya discloses that the outer pair of speakers L_l, L_r) is low pass filtered, but does not specify:

- that each low pass filter is of first order

However, various combinations of components are known in the art for deriving crossover networks, as is evidenced by the teachings of Steuben.

Regarding **Claim 4**, Steuben discloses:

- each low pass filter (130, in view of LPF of Oyaba) is of first order (col. 6, lines 1-2, 35-57)

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement the low pass filter of Oyaba as a first order, in-line low pass filter as disclosed by Steuben. The motivation behind such a modification would have been that such the impedance and bandwidth for the passed low frequency range would have been better controlled, as compared to conventional implementations. Such a filter use would have also eliminated the need for an additional high pass filter for the upper frequency speakers of Oyaba, creating a more efficient network.

Regarding **Claim 8**, please refer above to the rejection of the similar limitations of Claims 1 and 4.

Regarding **Claim 9**, Obaya teaches:

at least a third pair of transducers arranged in the array with the first pair of transducers and n increases by 1 for each pair of transducers, whereby n = 0 for the first pair of transducers, n = 1 for the second pair of transducers, and n = 2 for the third pair of transducers ("additional speakers", col. 4, lines 45-56; col. 5, lines 43-46)

Oyaba does not clearly specify "having a distance, d_n, between the center points of the transducers in the at least a third pair of transducers, wherein the midpoint of d_0 is the same midpoint of d_n; and wherein the distance, dn, is equal to $4nd_n$

However, Oyaba teaches that the relative distance between a pair of drivers may vary from 2 to 4 (col. 5, lines 35-42). Applying such a variable range to the spacing of another pair of additional speakers, specifically a relative spacing of "2" would have read on a respective $4nd_n$ spacing. The motivation for such a particular combination of the teachings of Oyaba would have been that it may well have exhibited a better directivity characteristic.

Regarding **Claim 11**, please refer above to the rejection of the similar limitations of Claims 1 and 4.

Regarding **Claim 16**, please refer above to the rejection of the similar limitations of Claim 4.

7. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oyaba in view of Steuben as applied above, and in further view of DeVries (6128395).

As detailed above, Obaya teaches a directional speaker system that comprises a line of paired speakers with particular operating frequencies and respective spacings. Steuben teaches a first order crossover filter.

As is evidenced by the teachings of Oyaba, and is known in the art, the spacing between the inner drivers controls the maximum operational frequency (col. 3, lines 38-60; col. 4, lines 45-48).

However, Oyaba in view of Flanagan does not clearly specify:

- d0 is 1.2 inches, d1 is 4.8 inches, and d2 is 9.6 inches.

DeVries teaches a directional speaker system.

Regarding **Claim 10**, DeVries discloses:

d0 is 1.2 inches, d1 is 4.8 inches, and d2 is 9.6 inches (DeVries teaches a directional frequency up to about 10 Khz, which equates to a spacing of 1.2 inches, col. 1, lines 34-37; the relevant other teachings of spacing per Oyaba read on the spacings of 4.8 inches and 9.6 inches, as discussed above in regards to Claims 1, 5, and 9).

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement a directional frequency band of up to about 10KHz, resulting in the claimed spacings, for the system of Oyaba in view of Flanagan, as is taught by DeVries. The motivation behind such a modification would have been that such a frequency range would have given the system a range adequate for many audio applications.

8. Claims 12 and 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oyaba in view of Steuben as applied above, and in further view of Flanagan.

As detailed above, Obaya teaches a directional speaker system that comprises a line of paired speakers with particular operating frequencies and respective spacings. Steuben teaches a first order crossover filter, comprising "a low pass filter of first order", as detailed above.

Oyaba in view of Steuben does not clearly specify:

- a low pass filter on the at least a third pair of transducers.

Flanagan teaches a transducer system with a directional response.

Specifically regarding Claim 12, Flanagan teaches:

a low pass filter on the at least a third pair of transducers (col. 4, lines 56-68; col. 5, lines 1-23; col. , lines 14-16 and 61-63)

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement an low pass filters on the additional drivers of Oyaba in view of Steuben with a cutoff frequency lower than that of the inner or middle drivers as is taught by Flanagan. The motivation behind such a modification would have been that decreasing the size of the array as the frequency of the transduced sound increases would have minimized beamwidth variations over the desired frequency range.

Regarding **Claim 13**, Flanagan discloses:

the outermost pair of transducers in the array has the lowest frequency low pass filter (col. 6, lines 14-16).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is 571-272-7517. The examiner can normally be reached on Monday-Friday, 8:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sinh Tran can be reached on 571-272-7564. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PRIMARY EXAMINER